(19) Europäl h s Patentamt
European Pat nt Office
Offic uropéen d brev ts

(11) EP 0 967 775 A2

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
29.12.1999 Bulletin 1999/52

(51) Int Cl.[6]: **H04M 3/42**

(21) Application number: **99304671.3**

(22) Date of filing: **15.06.1999**

(84) Designated Contracting States:
AT BE CH CY DE DK ES FI FR GB GR IE IT LI LU MC NL PT SE
Designated Extension States:
AL LT LV MK RO SI

(30) Priority: **23.06.1998 US 103021**

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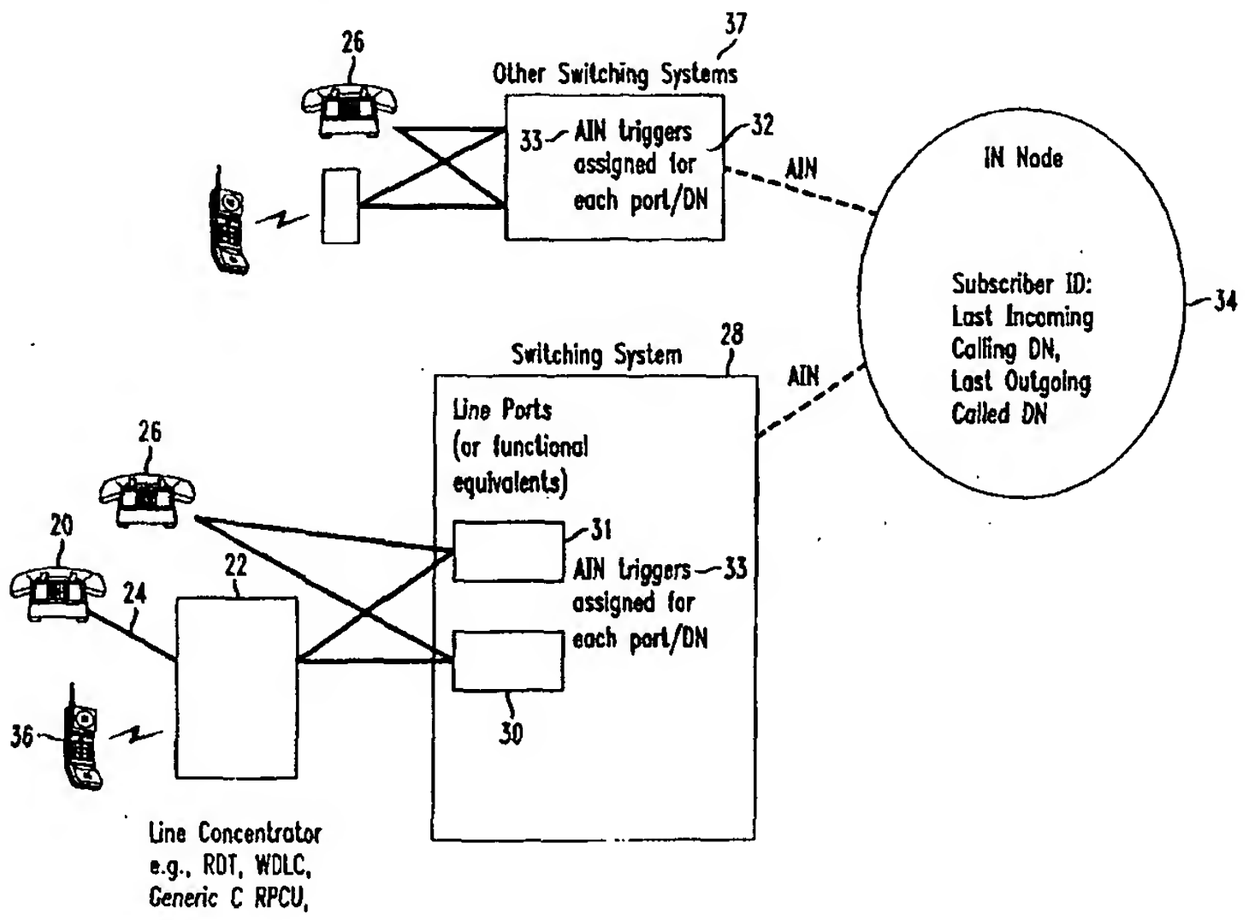
(54) Method and apparatus for tracking call history for mobile and wireline users accessing the network on different ports for subsequent calls

(57) This invention provides a method and apparatus for associating call data with particular users instead of line ports. This call data includes the last incoming and outgoing calls associated with a particular number. This allows the services such as automatic callback, automatic recall, and customer originated trace to be implemented with dynamic line assignment allowing users to maintain the same level of subscribed services at different locations. For mobile users, automatic callback, automatic recall, and customer originated trace can be implemented at the home mobile switching center as well as roaming mobile switching centers. If the mobile user is roaming, updating the call history of the mobile station at the new mobile switching center allows the mobile user to experience seamless services across a large territory.

FIG. 2



EP 0 967 775 A2

Description

Field of the Invention

[0001] This invention relates to the tracking of call history for wireline users and updating this information at new switches as dynamic line assignment is employed. This invention also applies to mobile users as call history is transferred between mobile switching centers as a mobile user roams.

Background

[0002] Currently, there are several services offered by telecommunication providers where previous call history from the line port used by the subscriber is used as input data. Examples of these services include automatic callback, automatic recall, and customer originated trace. The automatic callback service allows a user to place a call to the *last party that called the user.* The automatic recall service allows a user to place a call to the *same number the user last called.* And, the customer originated trace allows a user to request an automatic trace of the last incoming call. For these types of services, saving the call history of a user is accomplished by saving the call history data as it relates to a particular line port.

[0003] There is a need to store call history related to users versus line ports. This is important because certain categories of users may not use the same line ports for subsequent calls. These users include mobile subscribers served via a pool of lines at the central office, wireline subscribers served via pool of lines at the central office where there are many subscribers in relation to a fewer number of ports (possibly for economic reasons in the case of competitive access providers), personal mobility service via wire line phones (smart cards that identify the person on "public" phones), and mobile subscribers on a mobile switching center where line ports are not used. Therefore, a need exists to track and store call history as it relates to a subscriber number rather than a line port.

Summary

[0004] This invention provides a method and apparatus for associating call data with particular users instead of line ports. This call data includes the last incoming and outgoing calls associated with a particular number. This allows the services such as automatic callback and automatic recall and customer originated trace to be implemented without regard to the line port allowing users to maintain the same level of subscribed services at different locations.

[0005] For mobile users, automatic callback and automatic recall and customer originated trace can be implemented at the home mobile switching center as well as roaming mobile switching centers. If the mobile user is roaming at least two schemes can be deployed for updating the mobile switching center with call history information. First, when the mobile station registers with a mobile switching center, the previous mobile switching center transmits the call history to the new mobile switching center. Second, when the mobile station registers with a mobile switching center, the home location register or the wireless intelligent network obtains the call history information from the previous mobile switching center and transmits this information to the new mobile switching center.

Brief Description of the Drawings

[0006] The summary of the invention, as well as the following detailed description of preferred embodiments, is better understood when read in conjunction with the accompanying drawings, which are included by way of example, and not by way of limitation with regard to the claimed invention.

[0007] Figure 1 illustrates a prior art block diagram of a switching system with the call history associated with the line ports.

[0008] Figure 2 illustrates a block diagram of tracking the call history for an intelligent network node.

[0009] Figure 3 illustrates a block diagram of tracking the call history for wireless subscribers via a wireless intelligent network node service control point.

[0010] Figure 4 illustrates a block diagram for transferring call history information to the various mobile switching centers.

[0011] Figure 5 illustrates a message flow diagram for call origination and termination and the associated updating of call history information for an intelligent network node.

[0012] Figure 6 illustrates a message flow diagram for automatic callback service when a user employing dynamic line assignment moves to a new switch.

[0013] Figure 7 illustrates a message flow diagram for automatic recall service when a user employing dynamic line assignment moves to a new switch.

[0014] Figure 8 illustrates a message flow diagram for call origination and termination and the associated updating of call history information for a wireless intelligent network node.

[0015] Figure 9 illustrates a message flow diagram for automatic callback service when a mobile user moves to another mobile switching center.

[0016] Figure 10 illustrates a message flow diagram for automatic recall service when a mobile user moves to another mobile switching center.

[0017] Figure 11 illustrates a message flow diagram for storing and updating call history information in the mobile switching center/visitor location registry.

[0018] Figure 12 illustrates a message flow diagram for a first scheme for transferring call history information to another mobile switching center/visitor location registry.

[0019] Figure 13 illustrates a message flow diagram for a second scheme for transferring call history information to the mobile switching center/visitor location registry.

D tailed D scription of Pr f rred Embodiments

[0020] Figure 1 illustrates a prior art block diagram of a switching system with the call history associated with the line ports. In prior art systems, subscriber telephones 10 are connected via twisted pair lines 12 to line ports 14 located in the switching system 16. Each line port 14 is connected and associated with a specific subscriber's telephone line 12. Call history information is stored in the switching system's memory and associates call history information such as last called number and last calling number with each line port ID 18.

[0021] Figure 2 illustrates a block diagram of a switching system with an intelligent network based call history. A subscriber's telephone 20 is connected to a line concentrator 22 containing a plurality of line cards or port via a twisted pair 24. A line concentrator 22 is an interface that allows low-usage subscriber lines to connect to the high-usage channels. Other telephones 26 and the line concentrators 22 are connected to the switching systems 28 at line ports 31 and 32. The switching system 28 can store into memory information regarding the tracking of each telephone independent of the line card or port. Each switching system 28 can support a plurality of line ports 30 and 31. Advanced intelligent network triggers 33 are assigned to each line port 30. The switching system 28, as well as other switching systems 37 are connected to an intelligent network node 34. The intelligent network node 34 assists in the transfer and storage of call history information such as the subscriber ID, last incoming calling dialed number, and the last outgoing called dialed number.

[0022] For example, as a user 36 disconnects from switching system 28, the call history information that is associated with a particular subscriber is tracked by the intelligent network node 34 via originating and terminating triggers. As other users 20 attempt to access the switching system 28, the line port 30 previously used by user 36 is now available to user 20 at the switching system 28. Since the intelligent network node 34 is tracking the call history of the users and not the line ports, hardware can be optimized across the switching system 28.

[0023] Figure 3 illustrates a block diagram of tracking the call history for wireless subscribers via a wireless intelligent network. When mobile user 38 connects to the mobile switching center (MSC) 40 through the base station 42, wireless intelligent network triggers are sent to the wireless intelligent network node service control point (WIN/HLR) 44 by the MSC 40. As the mobile user 38 travels to a point where the mobile switching center 40 terminates service and transfers the s rvice of the user 38 to a different MSC 46, the WIN/SCP 44 updates the call history and any additional information from th home location register (HLR) to the new MSC 46. This information is provided to and from th WIN/SCP 44 by originating and terminating triggers.

[0024] Figur 4 illustrates a block diagram for transferring call history information to the various mobile switching centers. When a mobile user turns on the cellular telephone (mobile station) 50, a registration message is sent from the mobile station 50 to the base station 52. A series of base stations are connected to a MSC 54.

[0025] When the mobile user places or receives a telephone call, the call history information is updated in the MSC 54. When the mobile station 50 moves to the outer range of the MSC 54, the mobile station 50 registers on the MSC 60 that is closest and capable of supporting the mobile station 50. The MSC 60 sends a registration message to the WIN/SCP 56.

[0026] There are at least two schemes for transferring call history information to the new MSC 60. First, the WIN/HLR 56 informs the second MSC 60 of the location of the most recent VLR for the mobile station 50 specifying the MSC 54. The MSC 60 sends a request to the MSC 54 for the most recent VLR and call history associated with mobile station 50. This information is sent by the MSC 54 to the MSC 60 and MSC 54 deletes the VLR corresponding to mobile station 50.

[0027] Second, the WIN/HLR 56 builds a new VLR for the mobile station 50 at the second MSC 60. A cancellation message is sent from the WIN/HLR 56 to the first MSC 54. As part of cancellation, the MSC 54 transmits the call history associated with the mobile station 50 to the WIN/HLR 56. The second MSC 60 receives the VLR including the call history from the WIN/HLR 56.

[0028] Figure 5 illustrates a message flow diagram for call origination and termination and the associated updating of call history information: When a user 100 receives an incoming call from another party on the PSTN 102 and the call is terminated 103 to switch B 106. Switch B 106 sends a termination message 107 with the calling digits to the intelligent network node 108. The intelligent network node 108 updates the call history information 111 with the telephone number of the other party who called the user 100. A trigger response 109 is sent by the intelligent network node 108 to switch B 106. Switch B 106 terminates the call 110.

[0029] When the user 100 originates a call 112, an origination trigger with the called number 114 is sent by switch B 106 to the intelligent network node 108. The intelligent network node 108 updates the call history information with the called number 116. The intelligent network 116 transmits a trigger response to switch B 106 and the origination call 120 is placed on the PSTN 102.

[0030] Figure 6 illustrates a message flow diagram for automatic callback service when a user employing dynamic line assignment moves to a new switch. With dynamic line assignment, a subscriber to a particular set of services has access to those services at different locations. For example, a subscriber who has subscribed

to automatic call back service at home, can have that service while on a business trip. When the user 100 from Figure 5, invokes the automatic call back service at another location, an origination signal 122 is sent to switch A 124. Switch A 124 transmits an origination trigger 126 to the intelligent network node 108. Th intelligent network node 108 recognizes the automatic call back service code, and retrieves the last incoming dialed number for user 100. The intelligent network node 108 transmits a trigger response with the last incoming dialed number 128 to switch A 124. Switch A 124 places the origination call 130 to the last dialed number.

[0031] Figure 7 illustrates a message flow diagram for automatic recall service when a user moves to a new switch. When the user 100 from Figure 7, invokes the automatic recall service at another location, an origination signal 132 is sent to switch A 124. Switch A 124 transmits an origination trigger 134 to the intelligent network node 108. The intelligent network node 108 recognizes the automatic recall service code, and retrieves the last outgoing dialed number for user 100. The intelligent network node 108 transmits a trigger response with the last outgoing dialed number 136 to switch A 124. Switch A 124 places the origination call 138 to the last dialed number.

[0032] Figure 8 illustrates a message flow diagram for updating and tracking call history information in a wireless network. When a mobile user 200 receives an incoming call from another party on the PSTN 202 and the call is terminated 203 to MSC B 204, MSC B204 transmits a termination message 207 with the calling digits to the wireless intelligent network node 208. The wireless intelligent network node 208 updates the call history information 211 with the telephone number of the other party who called the user 200. A trigger response 209 is sent by the wireless intelligent network node 208 to MSC B 206. MSC 206 terminates the call 210.

[0033] When the user 200 originates a call 212, an origination trigger with the called number 214 is sent by MSC B 206 to the wireless intelligent network node 208. The wireless intelligent network node 208 updates the call history information with the called number 216. The wireless intelligent network 216 transmits a trigger response to MSC B 206 and the origination call 220 is placed on the PSTN 202.

[0034] Figure 9 illustrates a message flow diagram for automatic callback service when a mobile user moves to another MSC. When the mobile user 200 from Figure 8, invokes the automatic call back service at another location, an origination message 222 is sent to MSC A 224. MSC A 224 transmits an origination trigger 226 to the wireless intelligent network node 208. The wireless intelligent network node 208 recognizes the automatic call back service code, and retrieves the last incoming dialed number for user 200. The wireless intelligent network node 208 transmits a trigg r response with the last incoming dialed number 228 to MSC A 224. MSC A 224 plac s the origination call 230 to the last dialed number.

[0035] Figure 10 illustrat s a message flow diagram for automatic recall service when a mobile user moves to another MSC. When the mobile user 200 from Figure 8, invokes the automatic r call s rvice at another MSC, an origination message 222 is sent to MSC A 224. MSC A 224 transmits an origination trigger 226 to the wirel ss intelligent network node 208. The wireless intelligent network node 208 recognizes the automatic recall service code, and retrieves the last outgoing dialed number for user 200. The wireless intelligent network node 208 transmits a trigger response with the last outgoing dialed number 228 to MSC A 224. MSC A 124 places the origination call 230 to the last dialed number.

[0036] Figure 11 illustrates a message flow diagram for storing call history information in the mobile switching center/visitor location registry (MSC/VLR). When a mobile user 300 receives an incoming call from another party on the PSTN 302 and the call is terminated 303, MSC/VLR B 306 stores the last incoming call into the call history information for the mobile user 300. The MSC/VLR 306 updates the call history information 311 with the telephone number of the other party who called the mobile user 300. The MSC/VLR 306 terminates the call 310.

[0037] When the mobile user 300 originates a call 312, the MSC/VLR 306 updates the call history information with the called number 314. The MSC/VLR 306 places origination call 316 to the PSTN 302.

[0038] Figure 12 illustrates a message flow diagram for a first scheme for transferring call history information to another mobile switching center. When the mobile station 300 registers with the new MSC/VLR A 304, a user ID 317 is sent from the mobile station to the MSC/VLR A 304. The MSC/VLR A 304 transmits a registration notification message 318 to the home location registry (HLR) 320. The HLR 320 replies with a registration response 322 including data to build the VLR and the last registered VLR for the mobile station 300. MSC/VLR A sends a request for call data 324 based on the instructions from the HLR 320 to MSC/VLR B 306. A call data response message 326 from the MSC/VLR B 306 is sent to the MSC/VLR A 304 with the last incoming and outgoing call data. Once received at the MSC/VLR A 304, the HLR 320 sends a registration cancellation message 328 to MSC/VLR B 306.

[0039] Figure 13 illustrates a message flow diagram for a second scheme for transferring call history information to the mobile switching center. When the mobile station 300 registers with the new MSC/VLR A 304, a user ID 330 is sent from the mobile station to the MSC/VLR A 304. The MSC/VLR A 304 transmits a registration notification message 332 to the home location registry (HLR) 320. The HLR 320 replies with a registration response 334 including data to build the VLR for the mobile station 300. The HLR 320 sends a request 336 for call data to the MSC/VLR B 306. The MSC/VLR B 306 transmits the call data 338 including the last incoming and outgoing calls to the HLR 320. The HLR 320 for-

wards 340 this data to the MSC/VLR A 304. The HLR 320 also sends a registration cancellation message 342 to the MSC/VLR B 306.

[0040] While exemplary systems and methods embodying the present invention are shown by way of example, it will be understood, of course, that the invention is not limited to these embodiments. Modifications may be made by those skilled in the art, particularly in light of this disclosure. For example, each of the elements of the disclosed embodiments may be utilized alone or in combination with elements of the other embodiments.

Claims

1. A method for tracking call history information for a telephone in a telecommunication network, comprising:

   transmitting from the telephone a first message comprising information for dynamically tracking the telephone independent of the line card, to a switch capable of dynamically assigning the telephone to a line card interface;
   storing into memory at the switch a first set of information referencing the telephone;
   transmitting a second message comprising a second set of information referencing call history of the telephone from the switch to a network node; and
   transmitting a third message comprising a third set of information referencing the call history of the telephone from the network node to the switch.

2. A method for tracking call history information for a mobile station in a telecommunication network, comprising:

   transmitting a first registration message from the mobile station to a first mobile switching center;
   transmitting a second message requesting call history information from the first mobile switching center be sent to a network node;
   transmitting a third message requesting the second mobile switching center to transmit the call history information to the first mobile switching center from the network node to a second mobile switching center; and
   transmitting a fourth message comprising the call history information associated with the mobile station, from the second mobile switching center to the first mobile switching center.

3. A method for tracking call history information for a mobile station in a telecommunication network, comprising:

   transmitting a first r gistration message from th mobile station to a first mobile switching center;
   transmitting a second message requesting call history information from the first mobile switching center be sent to a network nod ;
   transmitting a third message requesting the second mobile switching center to transmit the call history information to the first mobile switching center from the network node to a second mobile switching center; and
   transmitting a fourth message comprising the call history information associated with the mobile station, from the second mobile switching center to the first mobile switching center; and
   transmitting a fifth message comprising the call history information associated with the mobile station, from the network node to the first mobile switching center.

4. A method for tracking call history information in a telecommunication network, comprising:

   registering a mobile station at a first mobile switching center;
   transmitting a registration message from the first mobile switching center to a network node requesting mobile station information;
   transmitting the mobile station information from the network node to the first mobile switching center;
   creating a visitor location registry at the first mobile switching center from the mobile station information;
   transmitting a first set of called number digits from the mobile station to the first mobile switching center;
   storing in memory the first set of called number digits at the first mobile switching center;
   establishing a first communication path between the mobile station and a first called number corresponding to the first set of called number digits; and
   transmitting an off-hook message from the mobile station to the first mobile switching center.

5. A method for tracking call history information for a telephone in a telecommunication network, comprising:

   transmitting an off-hook message from a first telephone connected to a first load office switch;
   receiving an off-hook message at the first local office switch from the first tel phone;
   recalling from memory in the first local office switch, call history information corresponding to the first telephone;

transmitting called number digits from the first telephone; and
storing into the first load office switch's memory the called number digits.

6. An apparatus for tracking call history information for a mobile station in a telecommunication network, comprising:

the mobile station having means for registering with a first and second mobile switching center;
the first mobile switching center having means for storing a visitor location registry and call history information for the mobile station while the mobile station is registered; and
the second mobile switching center having a means for transmitting to a network node a request for the visitor location registry and the call history information for the mobile station to be transferred from the first mobile switching center to the second mobile switching center when the mobile station transfers its registration from the first mobile switching center to the second mobile switching center.

7. A computer useable medium having computer executable instructions for access by an application program being executed on telecommunication equipment, comprising:

the computer medium having computer readable program code embodied in the computer medium for transferring call history information to the telecommunication equipment, the computer readable program code comprising:

computer readable program code means for transmitting an outgoing call from a telephone to the telecommunication equipment, where the telecommunication equipment is capable of dynamic line assignment;
computer readable program code means for requesting call history information by the telecommunication equipment from an intelligent network node; and
computer readable program code means for transmitting the call history information from the intelligent network node to the telecommunication equipment.

8. A computer useable medium having computer executable instructions for access by an application program being executed on mobile switching center equipment, comprising:

the computer medium having computer readable program code embodied in the computer medium for transferring call history information to the mobile switching center equipment, the computer readable program code comprising:

computer readable program code means for transmitting mobile station registration information from a mobile station to the mobile switching center equipment;
computer readable program code means for requesting call history information by the mobile switching center equipment from a wireless intelligent network node; and
computer readable program code means for transmitting the call history information from the wireless intelligent network node to the mobile switching center equipment.

9. An apparatus for tracking call history information for a mobile station in a telecomnunication network, comprising:

means for receiving messages from the mobile station;
means for registering the mobile station with a first and second mobile switching center;
the first mobile switching center having means for storing a Visitor location registry and call history information for the mobile station while the mobile station is registered; and
the second mobile switching center having a means for transmitting to a network node a request for the visitor location registry and the call history information for the mobile station to be transferred from the first mobile switching center to the second mobile switching center when the mobile station transfers its registration from the first mobile switching center to the second mobile switching center.

10. An apparatus for tracking call history information for a telephone in a telecommunication network, comprising:

means for connecting the telephone to a switch;
means for connecting the switch to a communication network;
means for dynamically registering the telephone with the switch by using the means for connecting the telephone to the switch as the interface between the telephone and the switch; and
means for tracking the call history information for the telephone independent of the means for connecting the telephone to the switch.

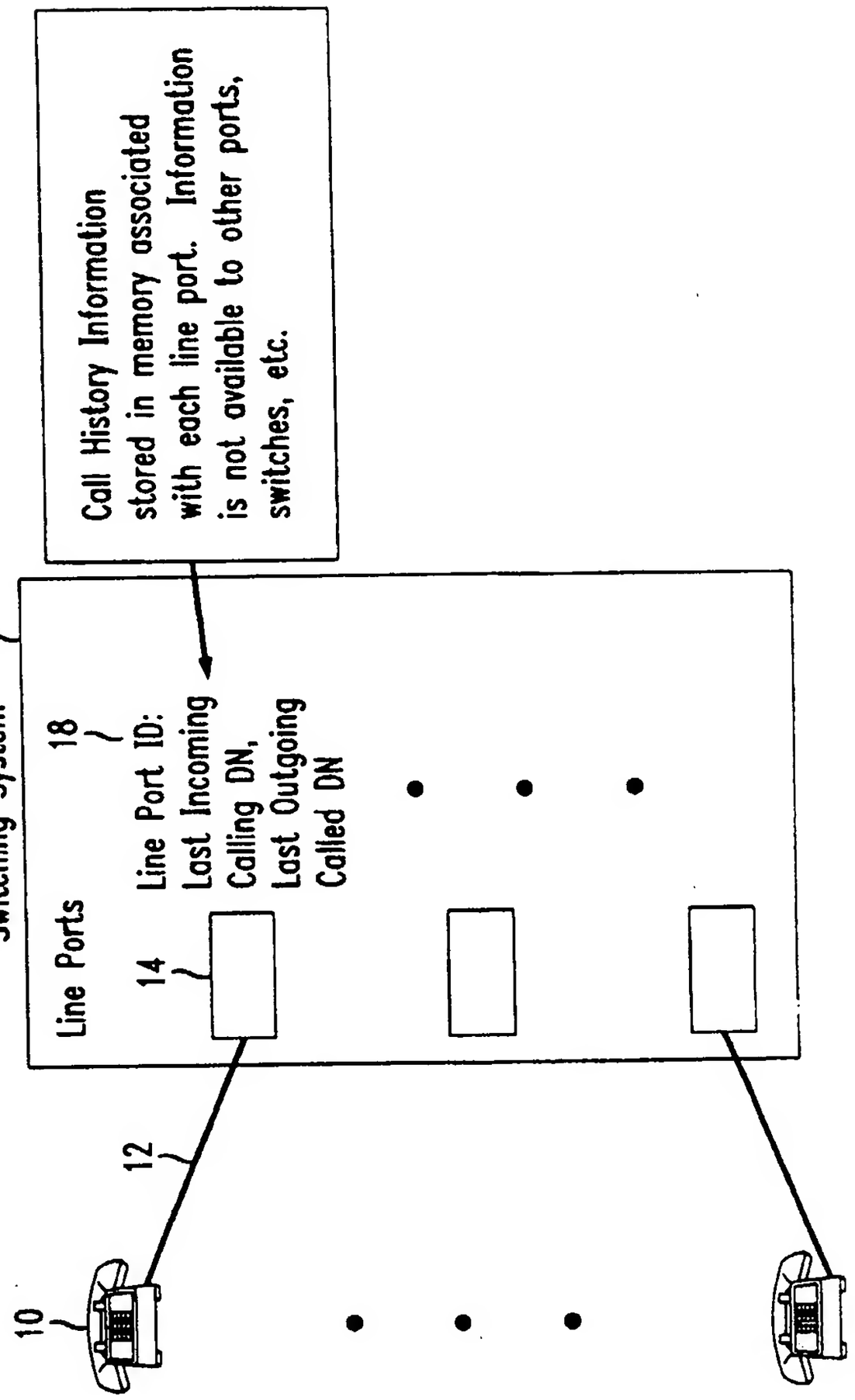


FIG. 1
PRIOR ART

FIG. 2

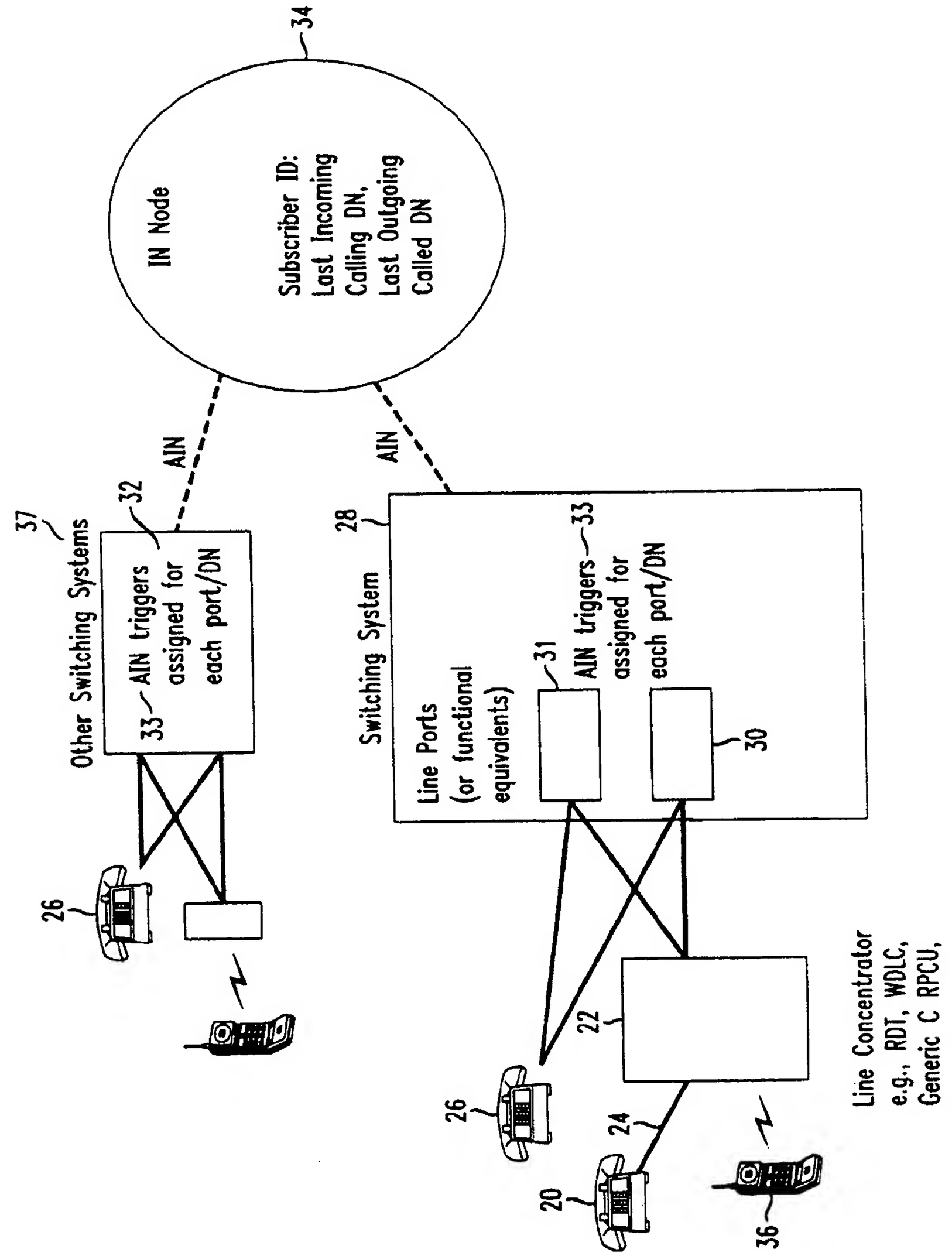
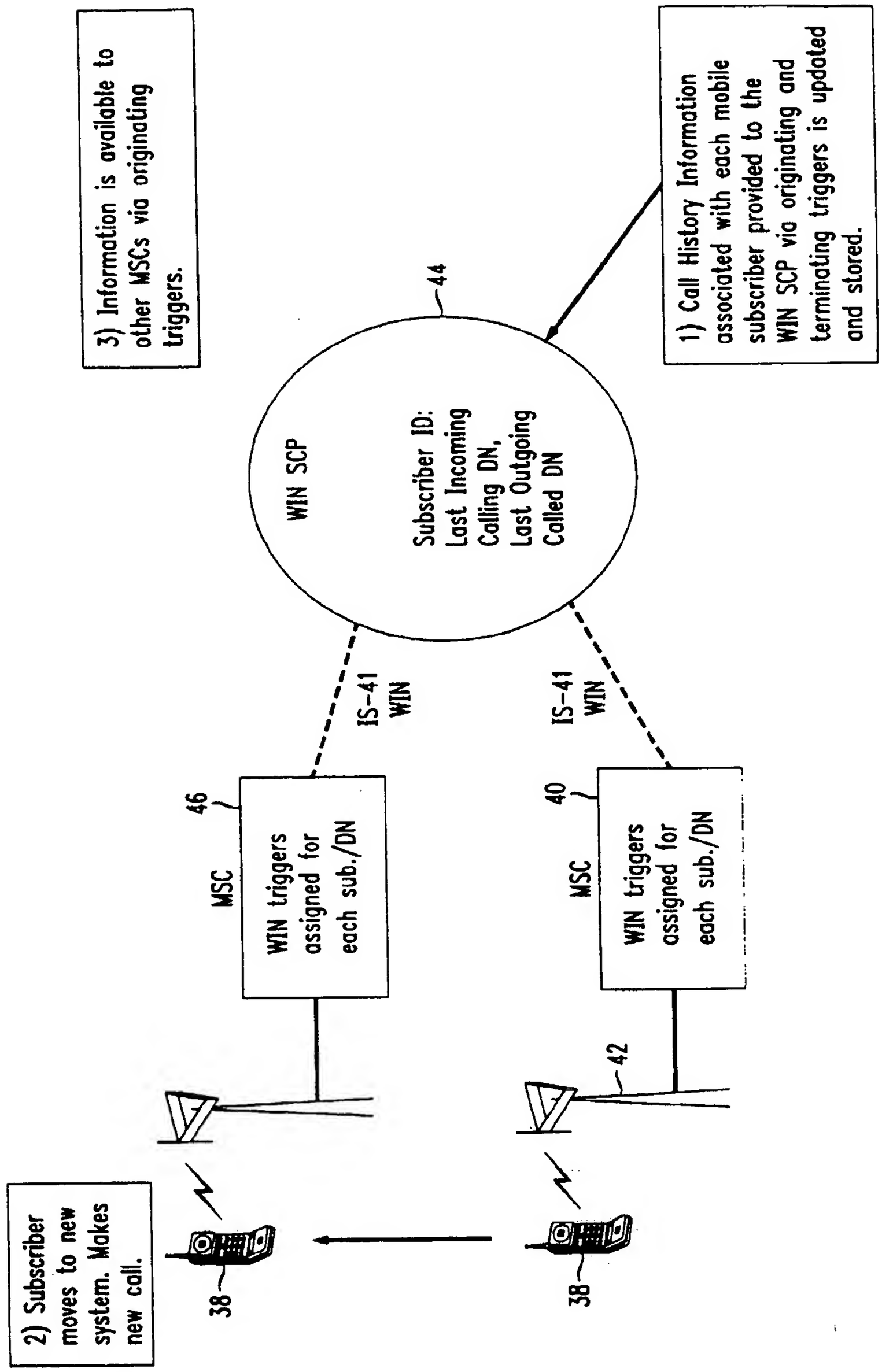

IN Node
34
Subscriber ID:
Last Incoming
Calling DN,
Last Outgoing
Called DN
AIN
AIN
37
Other Switching Systems
32
33
AIN triggers
assigned for
each port/DN
26
28
Switching System
Line Ports
(or functional
equivalents)
31
AIN triggers
assigned for
each port/DN
33
30
22
Line Concentrator
e.g., RDT, WDLC,
Generic C RPCU,
26
24
20
36

FIG. 3


3) Information is available to other MSCs via originating triggers.
1) Call History Information associated with each mobile subscriber provided to the WIN SCP via originating and terminating triggers is updated and stored.
44
WIN SCP
Subscriber ID:
Last Incoming Calling DN,
Last Outgoing Called DN
IS-41 WIN
IS-41 WIN
46
MSC
WIN triggers assigned for each sub./DN
40
MSC
WIN triggers assigned for each sub./DN
42
38
38
2) Subscriber moves to new system. Makes new call.

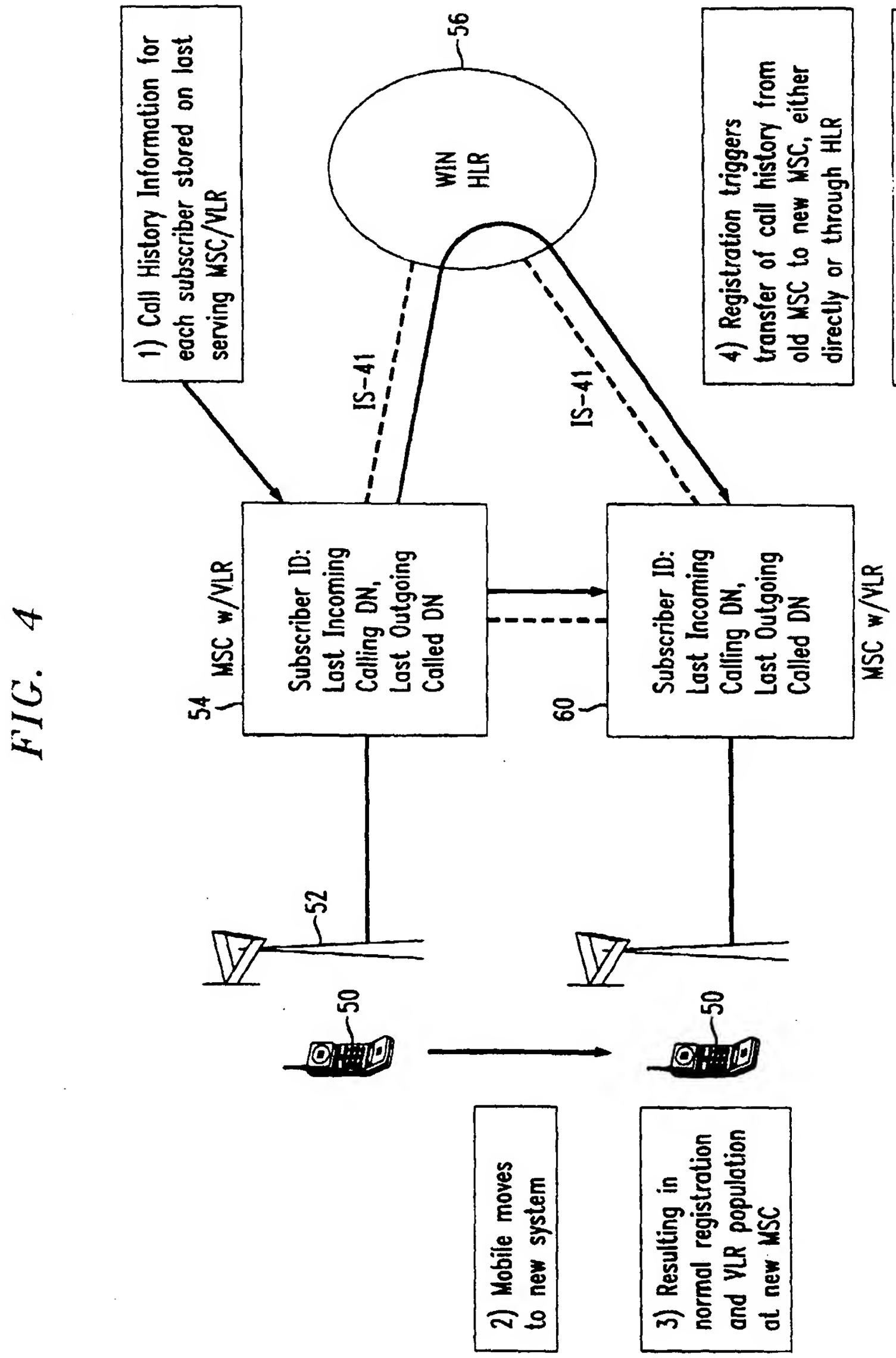

1) Call History Information for each subscriber stored on last serving MSC/VLR
56
WIN HLR
IS-41
IS-41
4) Registration triggers transfer of call history from old MSC to new MSC, either directly or through HLR
5) History available for subsequent calls.
54
MSC w/VLR
Subscriber ID: Last Incoming Calling DN, Last Outgoing Called DN
60
Subscriber ID: Last Incoming Calling DN, Last Outgoing Called DN
MSC w/VLR
52
50
50
2) Mobile moves to new system
3) Resulting in normal registration and VLR population at new MSC

FIG. 4

FIG. 5

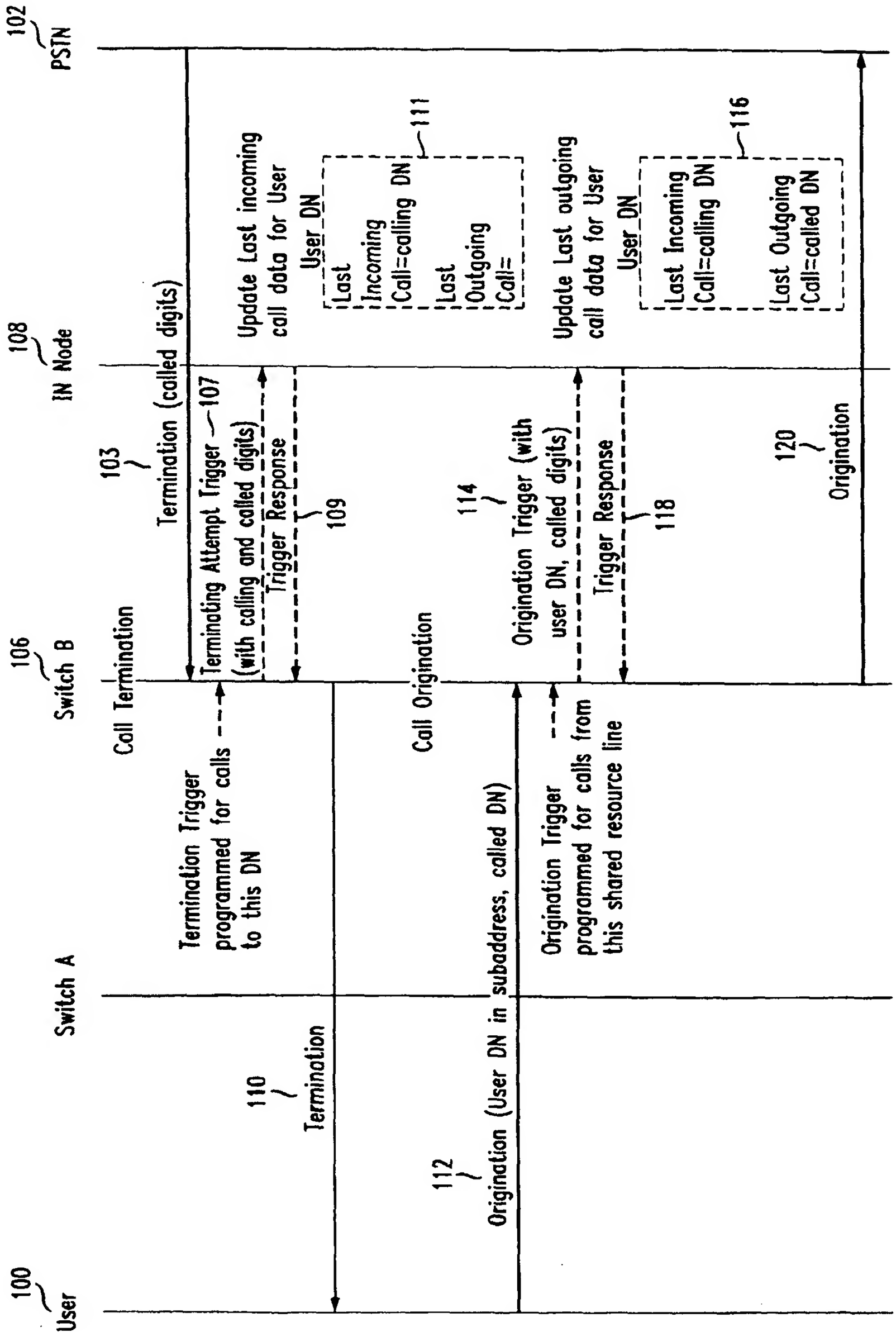

102
PSTN
108
IN Node
106
Switch B
103
Termination (called digits)
Call Termination
Terminating Attempt Trigger (with calling and called digits)
107
Trigger Response
109
Update Last incoming call data for User
User DN
Last Incoming Call=calling DN
111
Last Outgoing Call=
114
Origination Trigger (with user DN, called digits)
Trigger Response
118
Update Last outgoing call data for User
User DN
Last Incoming Call=calling DN
116
Last Outgoing Call=called DN
120
Origination
Termination Trigger programmed for calls to this DN
Call Origination
Origination Trigger programmed for calls from this shared resource line
Switch A
110
Termination
112
Origination (User DN in subaddress, called DN)
100
User

FIG. 6

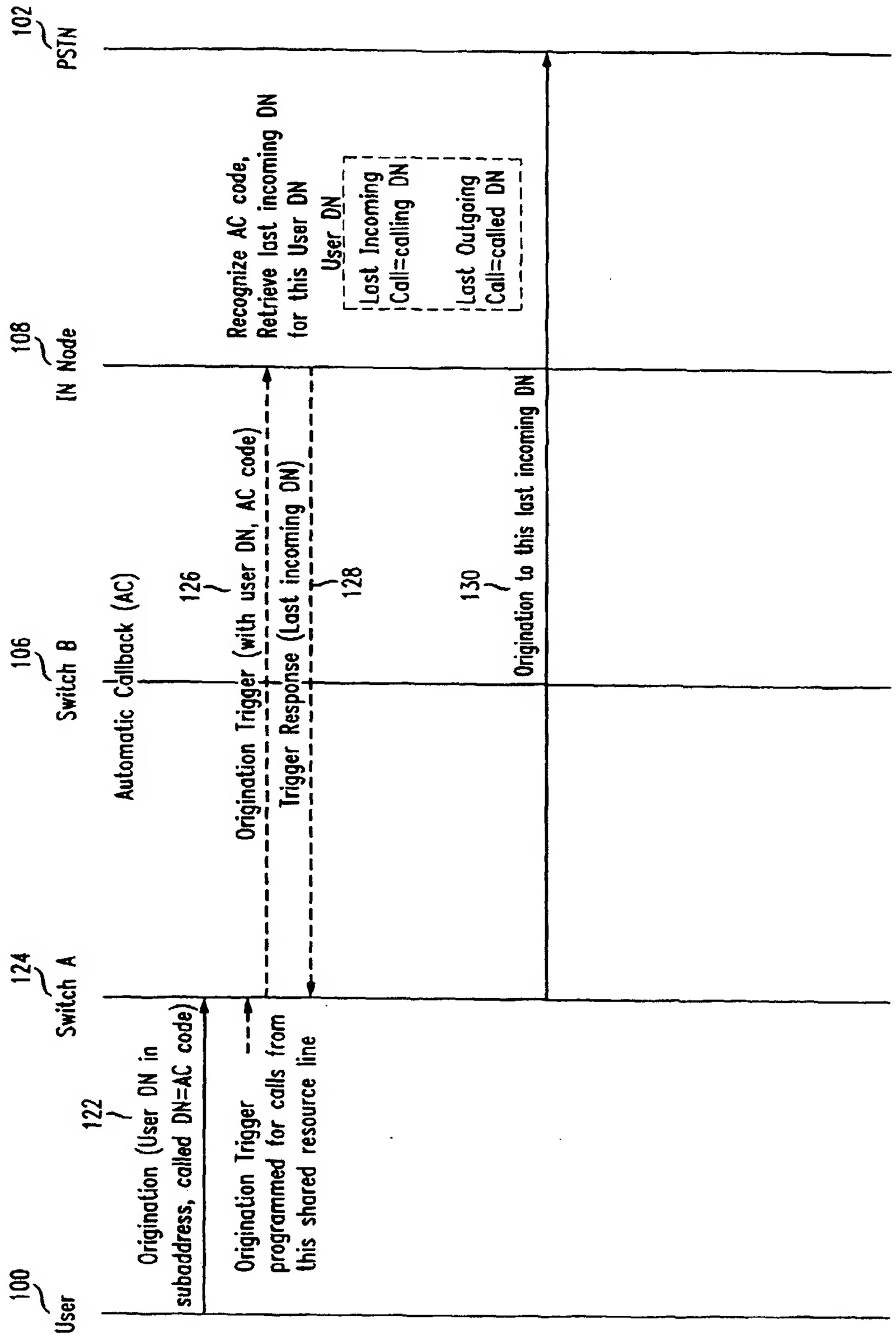

100
User
106
Switch B
102
PSTN
108
IN Node
124
Switch A
122
Origination (User DN in
subaddress, called DN=AC c
Automatic Callback (AC)
126
Origination Trigger (with user DN, AC code)
Trigger Response (Last incoming DN)
128
130
Origination to this last incoming DN
Origination Trigger
programmed for calls fr
this shared resource lin
Recognize AC code,
Retrieve last incoming DN
for this User DN
User DN
Last Incoming
Call=calling DN
Last Outgoing
Call=called DN

FIG. 7

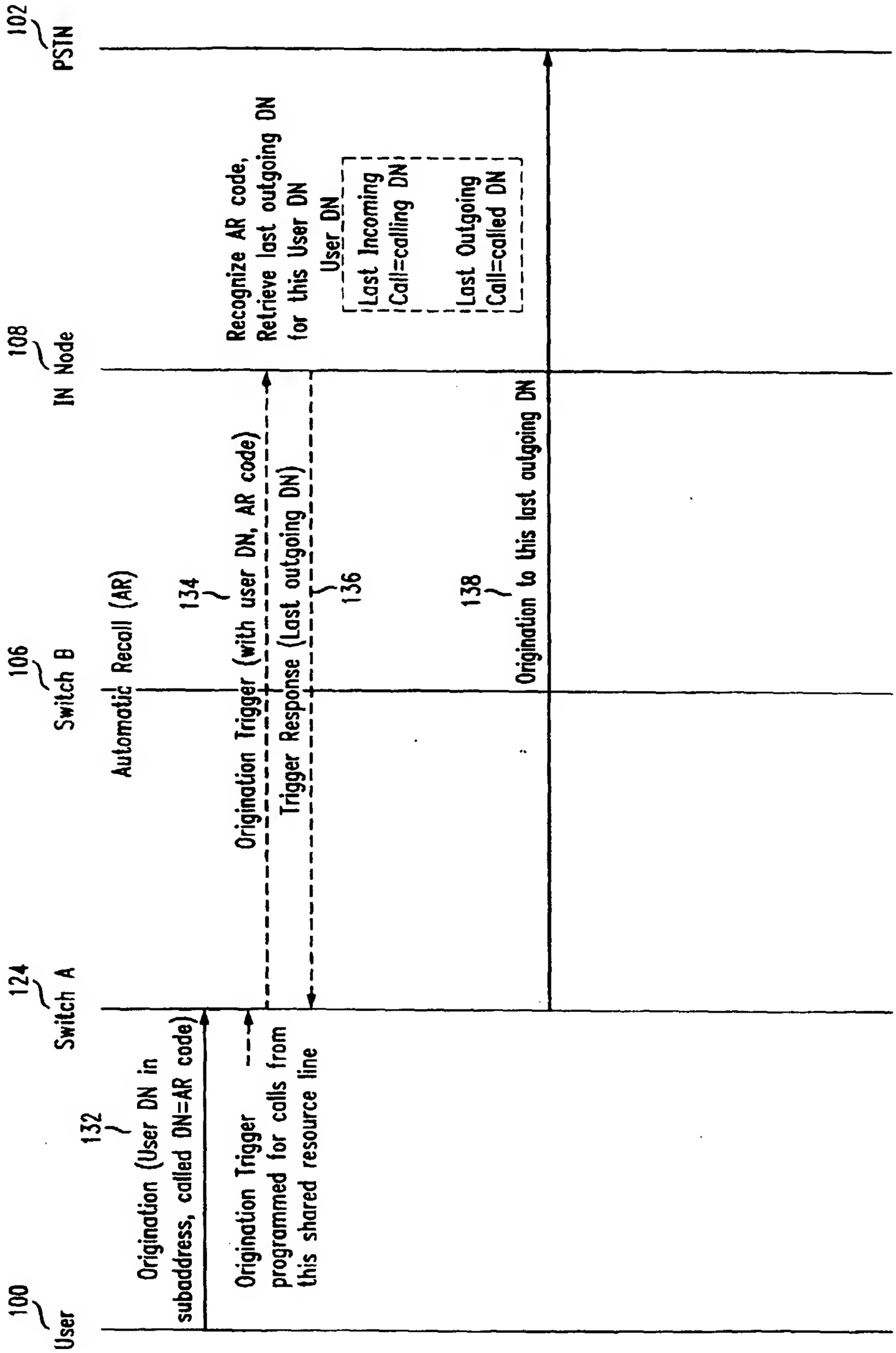

100
User
124
Switch A
106
Switch B
102
PSTN
108
IN Node
Origination (User DN in subaddress, called DN=AR code)
132
Origination Trigger - programmed for calls from this shared resource line
Automatic Recall (AR)
134
Origination Trigger (with user DN, AR code)
Trigger Response (Last outgoing DN)
136
Recognize AR code, Retrieve last outgoing DN for this User DN
User_DN
Last Incoming Call=calling DN
Last Outgoing Call=called DN
138
Origination to this last outgoing DN

FIG. 8

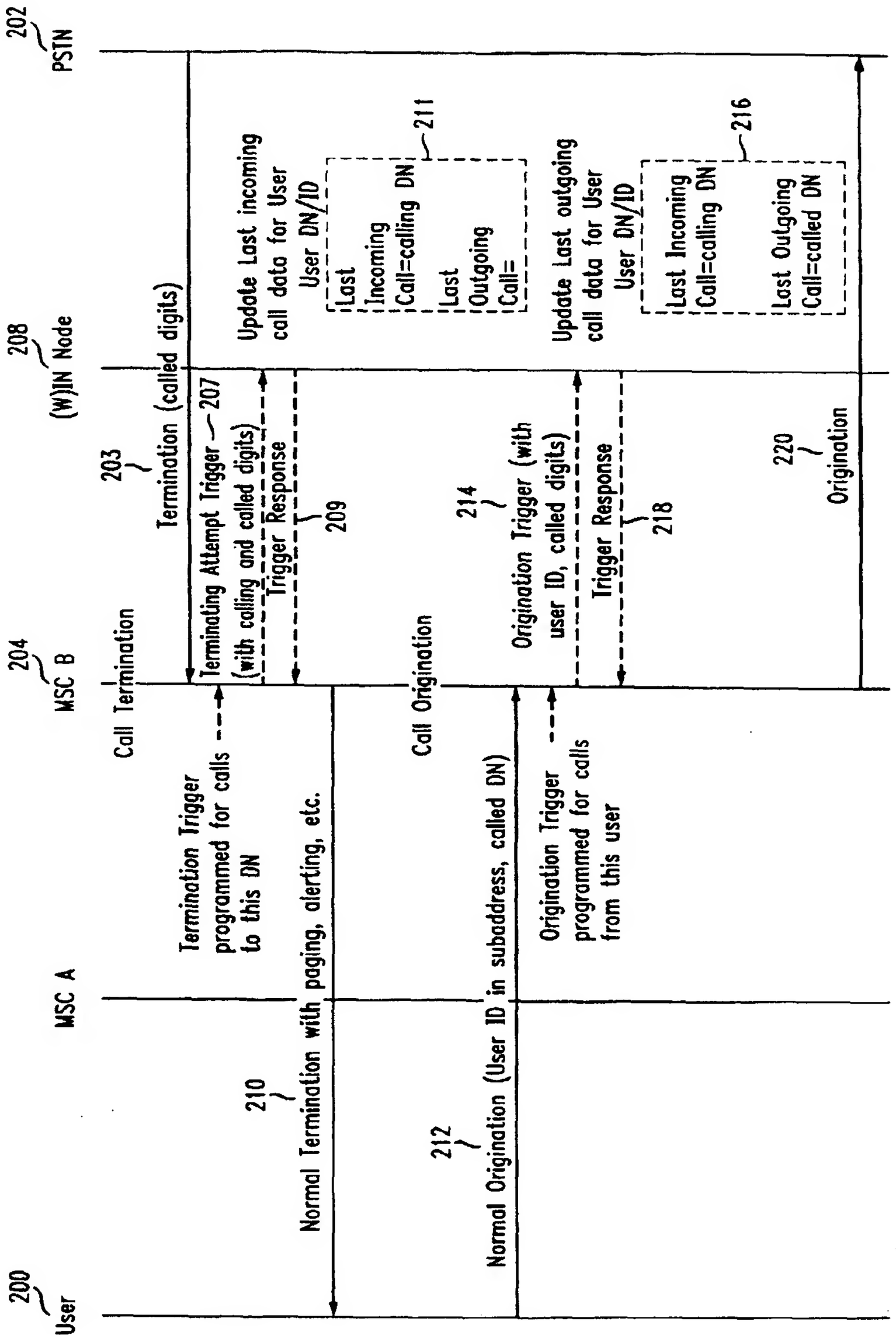

200
User
202
PSTN
208
(W)IN Node
204
MSC B
MSC A
Call Termination
Call Origination
203
Termination (called
214
Origination Trigger (with
user ID, called digits)
Trigger Response
218
220
Origination
Terminating Attempt Trigger
(with calling and called digits)
207
Trigger Response
209
Termination Trigger
programmed for calls
to this DN
Origination Trigger
programmed for calls
from this user
Update Last incoming
call data for User
User DN/ID
Last
Incoming
Call=calling DN
211
Last
Outgoing
Call=
Update Last outgoing
call data for User
User DN/ID
Last Incoming
Call=calling DN
216
Last Outgoing
Call=called DN
n with paging, alerting, etc.
ser ID in subaddress, called DN)
210
Normal Termination
212
Normal Origination (User

FIG. 9

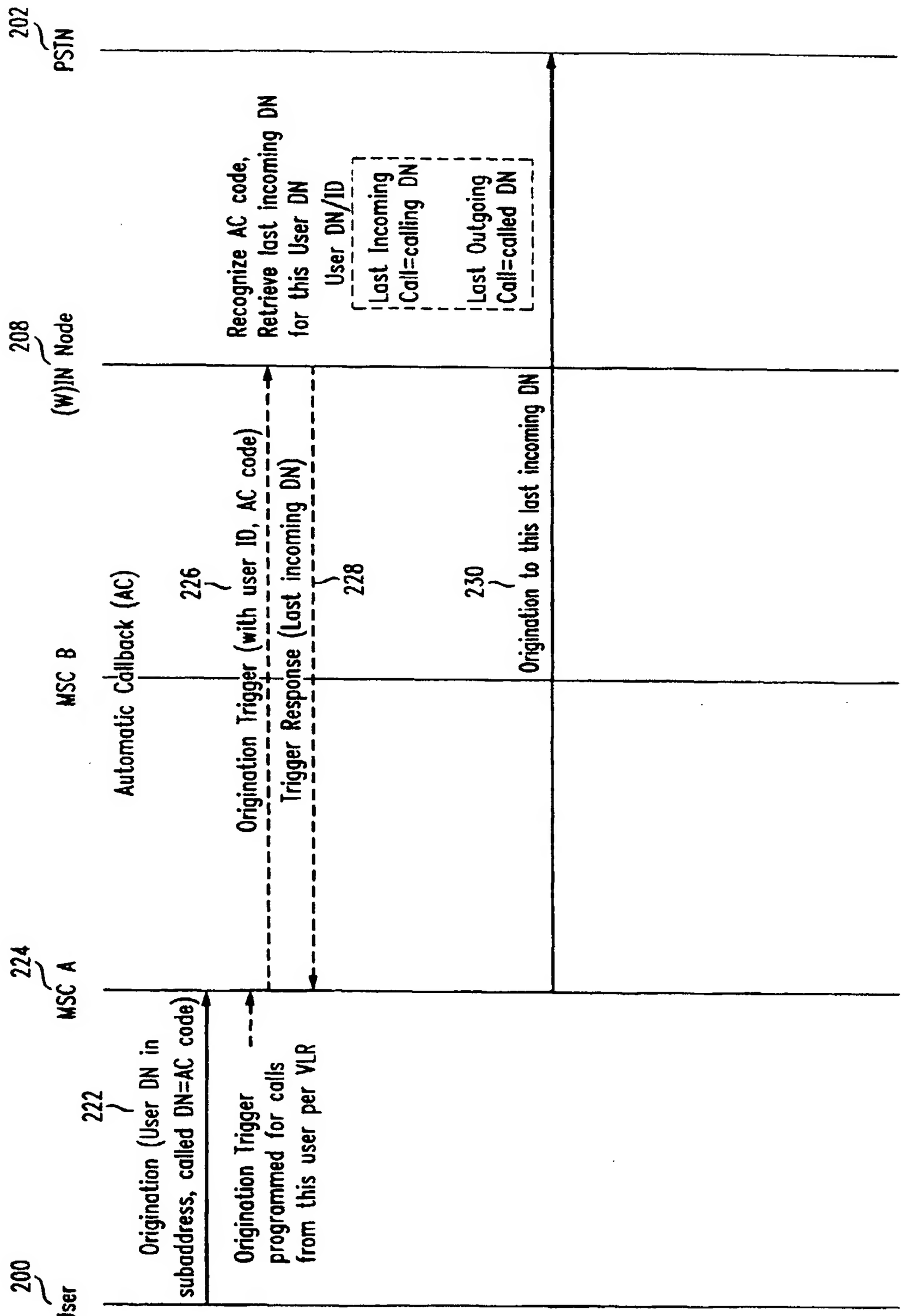

200
User
222
Origination (User DN in subaddress, called DN=AC code)
224
MSC A
Origination Trigger programmed for calls from this user per VLR
Automatic Callback (AC)
226
Origination Trigger (with user ID, AC code)
228
Trigger Response (Last incoming DN)
230
Origination to this last incoming DN
MSC B
208
(W)IN Node
202
PSTN
Recognize AC code, Retrieve last incoming DN for this User DN
User DN/ID
Last Incoming Call=calling DN
Last Outgoing Call=called DN

FIG. 10

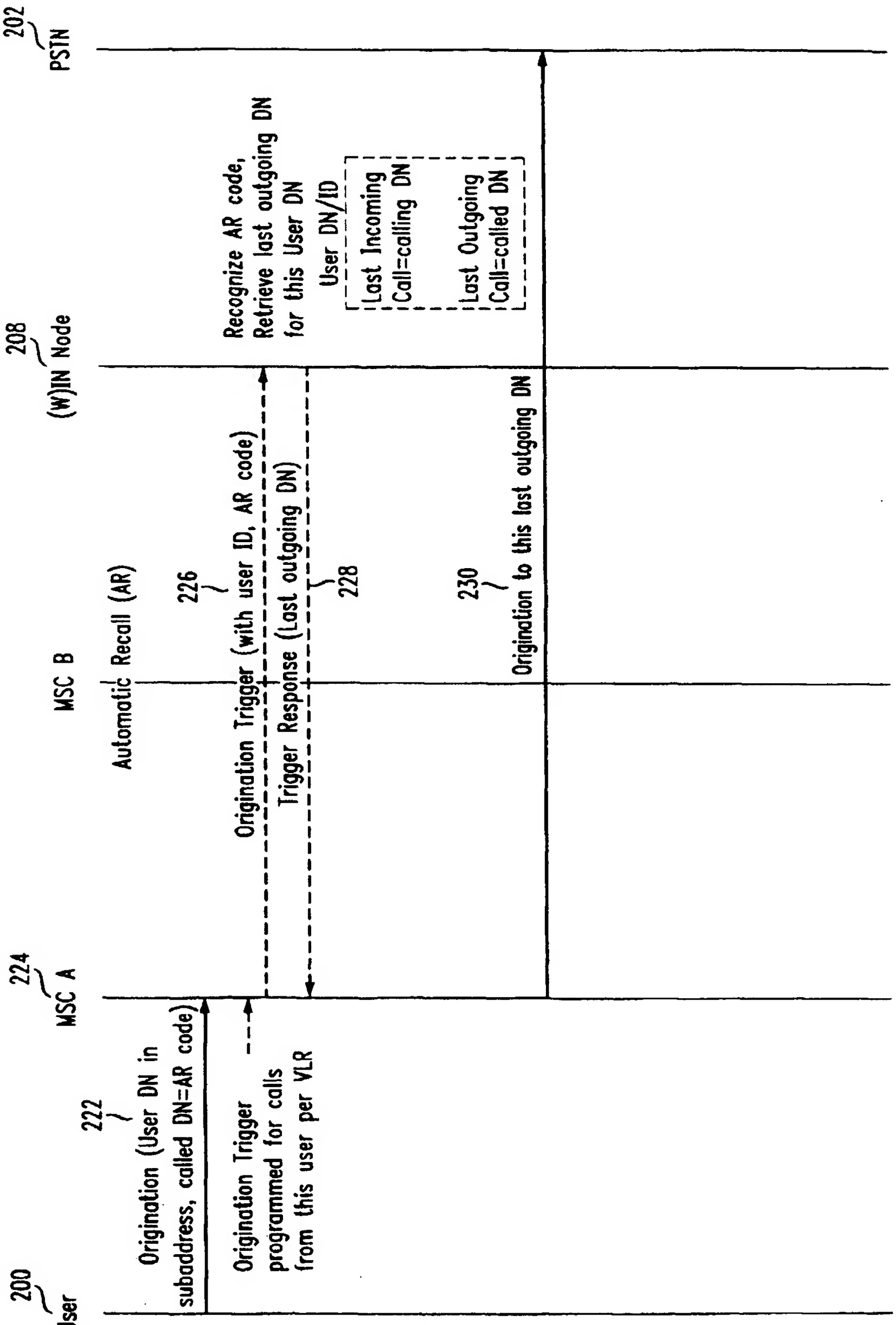

200
User
222
Origination (User DN in subaddress, called DN=AR code)
Origination Trigger programmed for calls from this user per VLR
224
MSC A
226
Origination Trigger (with user ID, AR code)
228
Trigger Response (Last outgoing DN)
230
Origination to this last outgoing DN
Automatic Recall (AR)
MSC B
208
(W)IN Node
Recognize AR code, Retrieve last outgoing DN for this User DN
User DN/ID
Last Incoming Call=calling DN
Last Outgoing Call=called DN
202
PSTN

FIG. 11

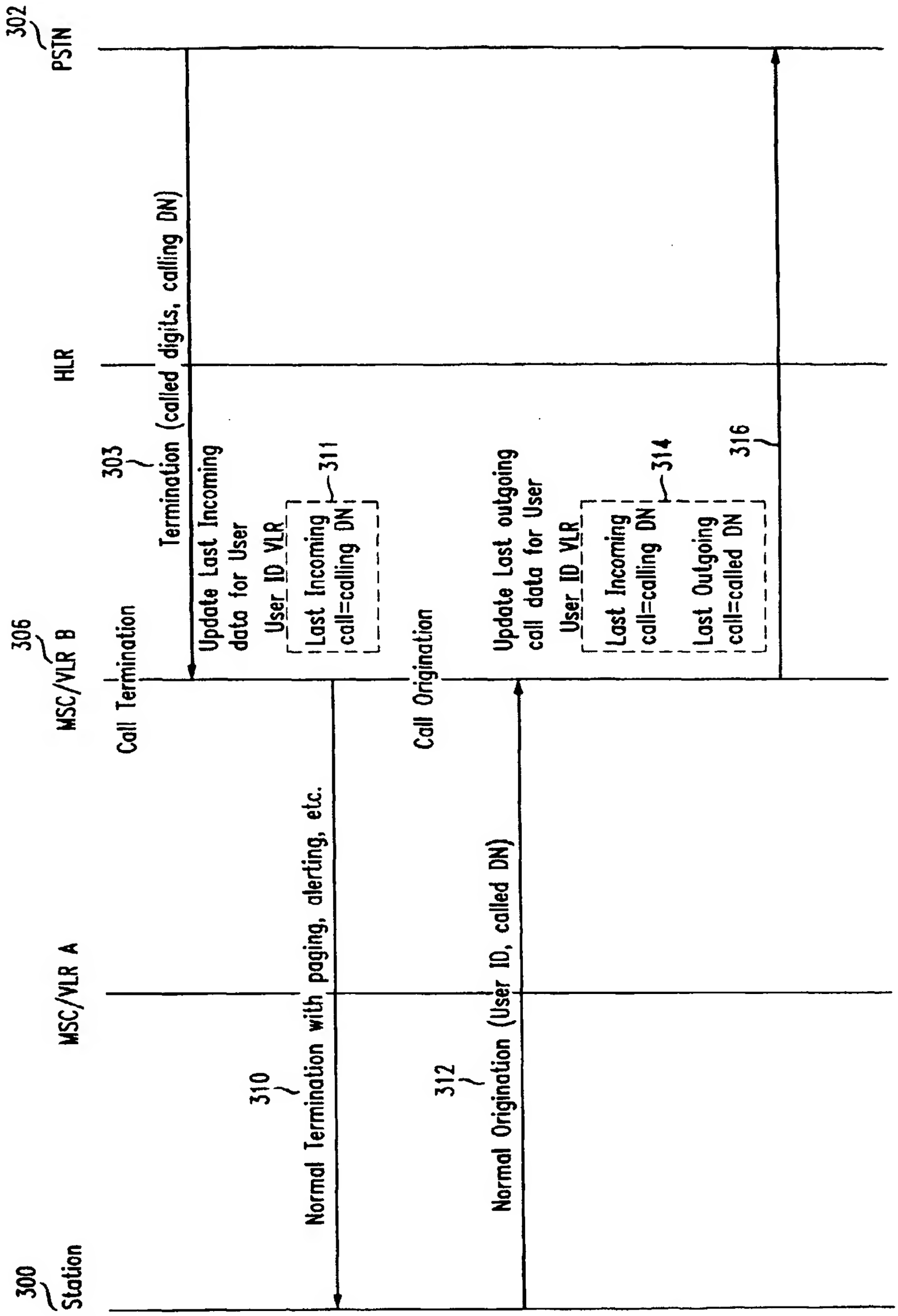
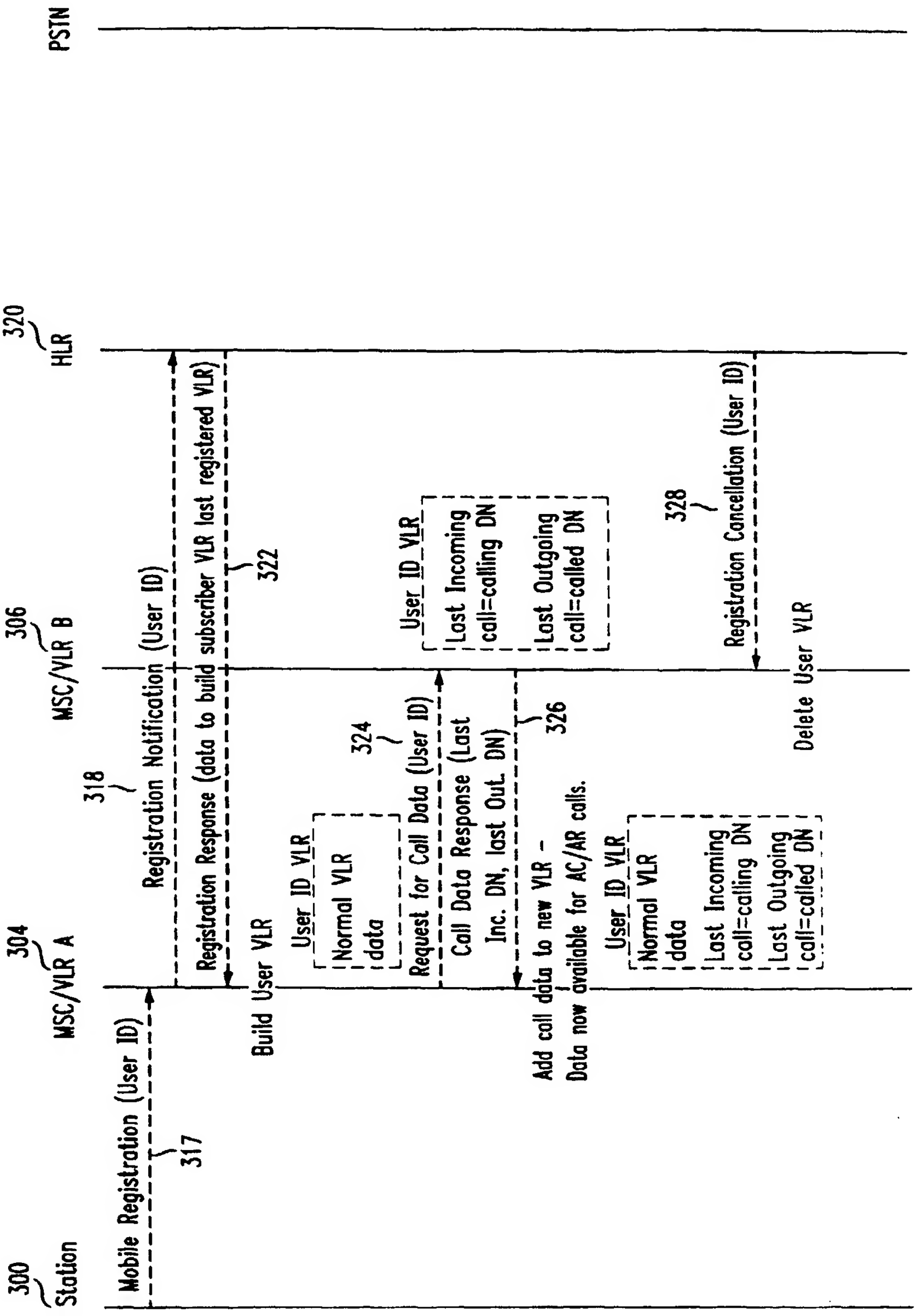

300
Mobile Station
MSC/VLR A
306
MSC/VLR B
HLR
302
PSTN
310
Normal Termination with paging, alerting, etc.
312
Normal Origination (User ID, called DN)
Call Termination
303
Termination (called digits, calling DN)
Update Last Incoming data for User
User ID VLR
Last Incoming call=calling DN
311
Call Origination
Update Last outgoing call data for User
User ID VLR
Last Incoming call=calling DN
314
Last Outgoing call=called DN
316

FIG. 12


PSTN
320
HLR
306
MSC/VLR B
304
MSC/VLR A
300
Mobile Station
Mobile Registration (User ID)
317
Registration Notification (User ID)
318
Registration Response (data to build subscriber VLR last registered VLR)
322
Build User VLR
User ID VLR
Normal VLR data
Request for Call Data (User ID)
324
Call Data Response (Last Inc. DN, last OutL DN)
Build call data to new VLR - now available for AC/AR calls.
326
User ID VLR
Normal VLR data
Last Incoming call=calling DN
Last Outgoing call=called DN
User ID VLR
Last Incoming call=calling DN
Last Outgoing call=called DN
328
Registration Cancellation (User ID)
Delete User VLR
Add
Data

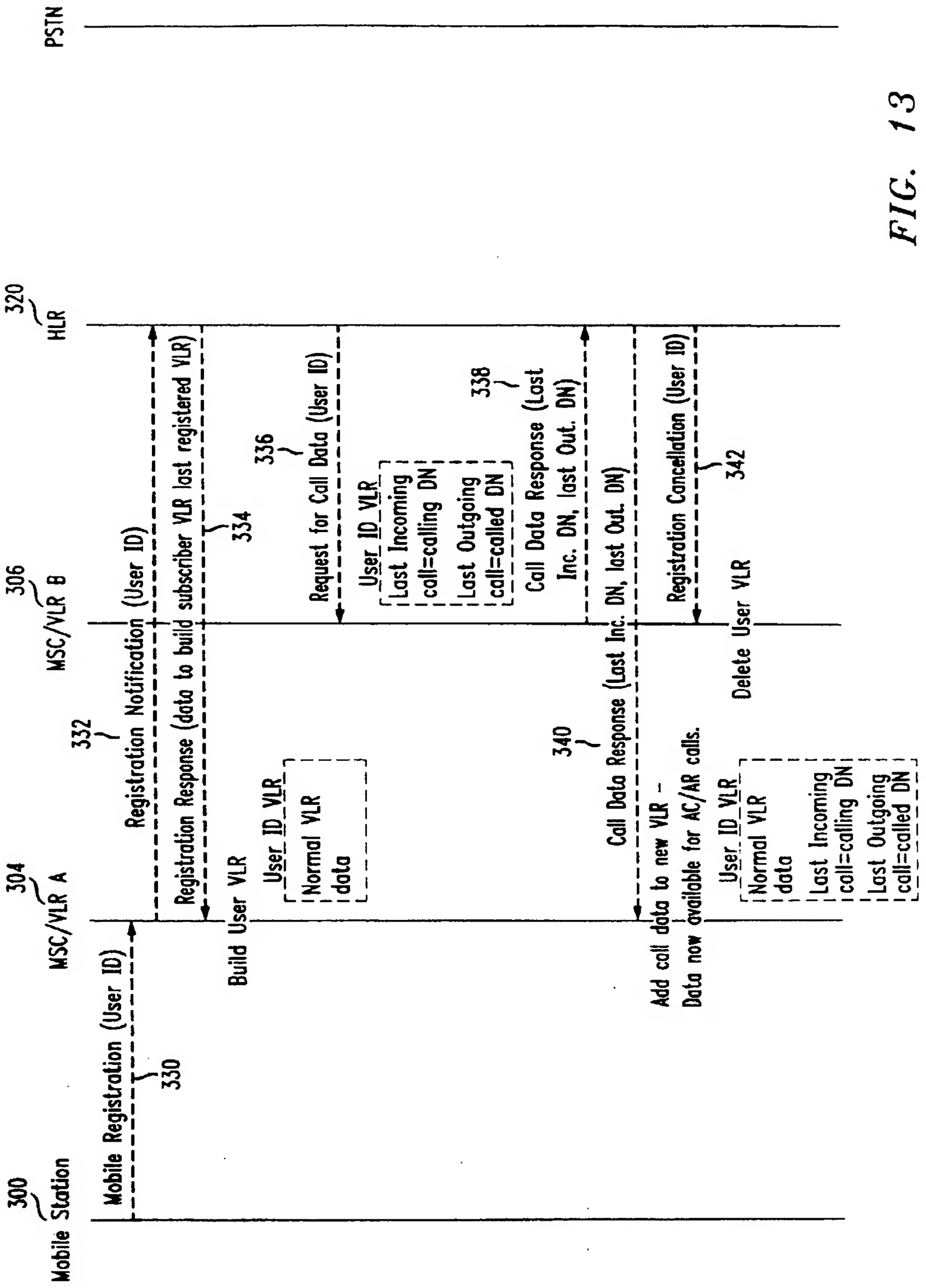

PSTN
320
HLR
306
MSC/VLR B
304
MSC/VLR A
300
Mobile Station
Mobile Registration (User ID)
330
Registration Notification (User ID)
332
Registration Response (data to build subscriber VLR last registered VLR)
334
Build User VLR
User ID VLR
Normal VLR data
Request for Call Data (User ID)
336
User ID VLR
Last Incoming call=calling DN
Last Outgoing call=called DN
338
Call Data Response (Last Inc. DN, last Out. DN)
Registration Cancellation (User ID)
342
Delete User VLR
340
Call Data Response (Last Inc. DN, last Out. DN)
Add call data to new VLR - Data now available for AC/AR calls.
User ID VLR
Normal VLR data
Last Incoming call=calling DN
Last Outgoing call=called DN

FIG. 13

European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 99 30 4671

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
X	DE 40 31 857 A (STANDARD ELEKTRIK LORENZ AG) 9 April 1992 (1992-04-09) * abstract *	5	H04M3/42 H04M3/48 H04Q3/00 H04Q7/38
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A	GARG V K ET AL: "SUBSCRIBER DATA MANAGEMENT IN PERSONAL COMMUNICATIONS SERVICES NETWORKS" IEEE PERSONAL COMMUNICATIONS,US,IEEE COMMUNICATIONS SOCIETY, vol. 4, no. 3, 1 June 1997 (1997-06-01), pages 33-39, XP000655314 ISSN: 1070-9916 * page 33, right-hand column, paragraph 2 - page 35, left-hand column, paragraph 1 *	2-4,6,8, 9	
Y	figure 2 Option 2: Network-resident	8	
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TECHNICAL FIELDS SEARCHED (Int.Cl.6)
H04M
H04Q

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	2 February 2000	Cremer, J

CATEGORY OF CITED DOCUMENTS

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